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CONCEPT NOTE

Theme: Scientific Development, Innovation and the Knowledge Economy

I. The Rationale

1. The world is undergoing a new industrial revolution – ‘the Knowledge Revolution’ – fuelled by the pace of technological change. Research and development (R&D) is at the helm of scientific and technological progress and is key to increasing productivity, exploiting growth opportunities in emerging markets and creating knowledge-driven competitive advantage. Science, technology and innovation (STI) has not only resulted in great technological advances that influence our daily lives, but has also transformed whole societies and lifted hundreds of millions of people out of poverty. Africa is the only region yet to fully exploit the great potential of using science and technology as an engine of growth and development.

2. ECA promotes and facilitates implementation of the 2005 Consolidated Plan of Action of the African Union Commission (AUC) within the framework of the New Partnership for Africa’s Development (NEPAD). This Plan calls for utilization of STI for the sustainable socio-economic development of the African continent and promotes the vision and priorities of the African Union (AU) on regional integration.

3. The main theme of the 8th African Union Summit (22-30 January 2007, Addis Ababa, Ethiopia) was science, technology and scientific research for development and the importance of STI as a driver of economic growth and poverty reduction in Africa. The Summit proposed that new efforts to build constituencies and champions for STI in Africa be launched in 2007. It also supported the establishment of the Pan-African Intellectual Property Organization (PAIPO) and reiterated its commitment to the Khartoum 2006 Decision urging member States to allocate at least 1 per cent of Gross Domestic product (GDP) to R&D. The Summit also endorsed the need for South-South and North-South cooperation in STI.

4. UNECA, in collaboration with AUC and other United Nations agencies and partners, organized the Science with Africa Conference¹, which was held in Addis Ababa, Ethiopia 3-7 March 2008. The conference highlighted the importance of STI in Africa's economic growth. The main aim was to explore how African scientists could increase their collaboration and participation in international science initiatives and R&D projects to accelerate the use of STI in the African development process.

5. The overall theme of CODIST is “*Scientific Development, Innovation and the Knowledge Economy*”, to explore how African countries are building their information and communication technology (ICT) and science and technology (S&T) base towards attaining a knowledge and innovation-based economy. Policymakers must understand how to harness and utilize STI effectively to achieve public goals such as public health, environmental sustainability, economic development, and national security. For innovation to occur, scientific, business and institutional knowledge is required from different sources. An innovation system is based on a network within an economic system, which connects the different organizations or stakeholders involved in the creation, adoption, use and diffusion of scientific and technological knowledge. To promote a coherent system of innovation requires: support for R&D; an active public sector; manufacturing, trade and industry capability; creation of domestic markets; development of export markets; creation of intellectual property systems; and creation of an appropriate policy environment.

¹ www.uneca.org/sciencewithafrica/

II. Conceptual framework

6. The term “knowledge economy” (KE) reflects the increasing importance of knowledge for economic development - an economy in which knowledge is the key resource. A knowledge-driven economy is one in which “the generation and the exploitation of knowledge have come to play the predominant part in the creation of wealth. It is not simply about pushing back the frontiers of knowledge; it is also about the more effective use and exploitation of all types of knowledge in all manner of economic activity”². In short, the knowledge economy is an economy that creates, disseminates and uses knowledge to enhance its growth and competitiveness. Contrary to some beliefs, it is not necessarily about high-tech systems or information technology (IT). For example, the application of new techniques to subsistence farming can increase yields significantly; the use of information and logistical services can allow traditional craft sectors to serve much wider markets than before; instant messaging and online information creating opportunities for African women entrepreneurs to connect to regional and global supply chains; and the application of environmental technologies and practices enabling the ‘Green Revolution’ to take place in developing countries. These are all examples of the knowledge economy in action.

7. One of the most important determining factors in the knowledge-intensive economy is the speed of S&T innovation. Innovation in products, processes and organizational structures is a major source of growth and is a result of numerous interactions by a community of actors and institutions. Knowledge is important in encouraging innovation and creativity. However, many African countries have not accorded serious attention to STIs as engines of long-term, planned development.

8. The central role of knowledge and innovation in economic growth is widely acknowledged in developed countries. It is evident from these countries that the creation of a knowledge economy and knowledge-based industries does not happen in isolation, but is highly correlated with:

- a) The general health of the economy;
- b) The capacity of companies to engage in new endeavours and self-awareness of such capacity;
- c) Existence of the human capital within the companies and availability of additional supply;
- d) Conducive operating environment, including legal and regulatory regime; and
- e) Access to financial resources.

9. Investments in capacity building and S&T, particularly in strong innovation systems and in R&D, are necessary in a competitive environment. These investments are inevitably based on a long-term vision for the development of a country. This notion is less widely accepted in developing countries and the elaboration of appropriate and efficient policies for knowledge-based development processes is particularly challenging in view of the more difficult political and socio-economic environment in many of these countries.

² DTI, 1998. *Our Competitive Future: Building the Knowledge Driven Economy*, Department of Trade and Industry, London.

10. Studies have indicated that successful transition to a knowledge economy can be attained through four pillars considered critical as countries make more effective use of knowledge for overall economic and social development³.

These are:

- a) An *economic and institutional regime* that provides incentives for the efficient use of existing knowledge, creation of new knowledge and the flourishing of entrepreneurship;
- b) An *educated and skilled population* that can create, share and use knowledge well;
- c) A *dynamic information infrastructure* that can facilitate the effective communication, dissemination and processing of information; and
- d) An *efficient innovation system* of firms, science/research centres, universities, think tanks, consultants and other organizations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs and create new knowledge.

11. Although several countries in Africa have successfully embarked on National Information and Communication Infrastructure (NICI) and National Spatial Data Infrastructure (NSDI) processes that articulate long-term policy, infrastructure, content and application strategies as an integral part of their overall national development goals, implementation still remains a major challenge. Concerted efforts are still required to enable countries to build efficient innovation systems, through investment in R&D, education and ICT infrastructure.

III. Sub-themes

12. The CODIST sub-committees will address issues under the following two sub-themes:

- (a) The Enabling Environment for Innovation; and
- (b) Innovation and Economic Growth.

3.1 The Enabling Environment for Innovation

Framework conditions for innovation

13. Reviving growth through productivity is a main economic challenge for many African countries. High innovation performance will play a key role in boosting productivity. The enabling environment for innovation should stimulate knowledge creation and absorption by enterprises to enhance competitiveness, exploit synergies between enterprises and other centres of knowledge and provide incentives and support to inputs for innovation. This is so particularly with respect to a reliable legal framework, reliable information, a sophisticated financial system, a well-educated labour force, balancing demand and supply for highly qualified human resources for S&T and a favourable taxation regime.

14. To improve innovation performance, governments should meet the needs of all actors more comprehensively and efficiently and address to the following:

³ Derek H.C Chen, and Carl J. Dahlman, "The Knowledge Economy, the KAM Methodology and World Bank Operations", The World Bank, Oct 2005.

- a) Pursue efforts to increase competition and reduce market segmentation by revising the domestic market laws and eliminating any administrative and technical barriers to imports and negotiating the same for access to external markets;
- b) Remove administrative regulatory and financial barriers to entrepreneurship by streamlining administrative procedures, improving the tax regime and the institutional and regulatory framework for venture capital (high cost of equity financing impairs the creation and growth of small innovative firms);
- c) Improve the supply of human resources in S&T by pursuing reforms in the university systems including incentives for increasing women's interest in science and engineering;
- d) Accord high priority for public funding of STI in order to achieve world class research and innovative performance;
- e) Promote exchange between the public sector and academia regarding career patterns and mobility for cooperative research; and
- f) Take measures to make STI policies more responsive to the needs of the service sector including the financial industry.

Infrastructure

15. The availability and application of information is a key driver of a firm's ability to create and absorb new ideas. Electronic communication systems are at the centre of this information transfer process, so investment in ICT infrastructure is one way of stimulating growth in national innovation and economic productivity. Africa still lags behind other regions in terms of cost of doing business thus reducing potentially achievable growth rates. The unreliable infrastructure is one of the major reasons for the high transaction costs. This has led to much higher indirect costs thus reducing net productivity compared to competitors in the rest of the world.

16. ICT infrastructure is the foundation for ICT services and applications such as e-commerce, e-government, geoinformation systems and so on. For instance, with the developments in space and digital technologies in the past two decades, the time and cost for availing spatial information and maps for development and management purposes have been greatly reduced. The SDI aims to promote the increased access to and use of spatially based information resources in decision-making processes and employing appropriate ICT that lead to sustainable development within the respective sector. Moreover, this infrastructure is essential for African countries to achieve regional integration and to enable inclusive participation in the knowledge economy. Economic growth in Africa will depend upon widespread access to ICT services, which in turn provide access to local, national, regional and global markets. It becomes of paramount importance that national, regional backbones and cross-border links are expanded and rural access prioritized, in parallel with the deployment of applications that effectively utilize connectivity for productivity.

Human resource development

17. Human resource development is the main factor for economic prosperity and it is important that priority is accorded to investing in human capacity development. It is well acknowledged that the evolving knowledge-based economy has created continuous demand for a highly skilled workforce in the development, use and deployment of STI for socio-economic development, characterized by an ever increasing demand for highly skilled human resources for developing and maintaining a competitive edge in the global market. Educated and skilled human

resources form human capital, that is, the skills embodied in workers. These become the most valuable assets and a central pillar in development and growth. High-quality S&T education and training at all levels therefore becomes the core of a nation's technological and economic progress. A well-trained workforce is essential to the efficient acquisition, utilization, creation and dissemination of the relevant knowledge and skills that tend to increase productivity and economic growth. Since education is a fundamental key to wealth creation and competitiveness in the global knowledge economy, education and training providers will play a pivotal role in supporting all members of society as they adjust to the new environment of developing a vibrant knowledge-based economy.

18. Since education and training are the key enablers of the knowledge economy, an S&T education policy should be established to address national needs. New efforts are required for the attraction, development and retention of S&T talent. Centres of excellence are needed for S&T to flourish and support world-class S&T institutional collaboration. Virtual networks of excellence linking professionals from different locations working on similar problems through the power of ICT, can multiply the potential effectiveness of individual centres. Regional S&T support networks also need to be stimulated and strengthened.

19. For the knowledge economy in Africa to be successful, strengthening alliances for investment in training (formal, informal, vocational, lifelong learning, etc.) and human resource development are essential in the building of societies that are increasingly knowledge-based. The private sector is now recognized as the primary global force in S&T research and development. Funding is needed to encourage public-private partnerships and promote joint research. It is recognized that the core of research ability will be developed in higher education institutions such as universities and technical colleges. Thus, it is crucial that there is a commitment by national governments to achieve quality S&T higher education and appropriate training mechanisms.

20. Africa needs to strengthen its S&T base and capacity in order to:

- a) Bridge the scientific divide, and enhance the use of S&T as an enabler for poverty reduction, growth and socio-economic development;
- b) Increase the number of scientists, technicians and engineers;
- c) Improve infrastructure and facilities for R&D;
- d) Improve basic skills in the formal and informal sectors; and
- e) Use innovative approaches to improve the quality of primary and secondary education.

21. Areas to be covered under this sub-theme include:

- a) Regulatory reform in ICT infrastructure, STI and R&D policies and investment to foster innovation;
- b) STI indicators;
- c) S&T statistics for science policy and decision-making;
- d) Broadband infrastructure provision in universities and R&D institutions;
- e) Availability of non-commercial e-services – such as e-government, e-learning, telemedicine, R&D networking which also addresses the needs of African women and girls, etc;
- f) Promotion of earth observation S&T culture among Africans, particularly the youth;
- g) Geospatial data infrastructure - standards and interoperability, common geodetic framework, clearinghouses and metadata standards, direct receiving and broadcasting

- of data and products (e.g. GeonetCast system), land management information systems (LMIS), etc;
- h) Prioritized innovation in the development of the education curriculum (from primary to tertiary education);
 - i) Local innovation, communities and indigenous knowledge capacities; and
 - j) African KE benchmarks in education.

3.2 Innovation and Economic Growth

Innovation and Intellectual Property Rights (IPR)

22. IPR regimes affect the diffusion of scientific knowledge, the innovation process and ultimately, economic performance. The increasing importance of IPR in the innovation system is reflected in the growing number of patents in developed and to a lesser extent, in developing countries. Patent regimes have undergone major changes in recent years, most of them strengthening the rights of patent holders and extending the scope of patentable inventions. Patents play an increasingly important role in business strategies and the commercialization of technology. Some of the reasons advanced for the increase in IP-related activities include:

- a) Information technology, especially the Internet, is dramatically reducing the cost of disseminating knowledge thus making imitation easier, leading firms to seek for more protection;
- b) Technology markets are on the increase leading to the unfettered availability of knowledge and thus more filings for IPR in such markets;
- c) Increased competition as markets are often less regulated than before such that new entrants supported by venture capital can destabilize incumbents, making IPR a desirable route for protection against competitors; and
- d) IPR is an instrument with which government could provide incentives for invention and diffusion of technology by structuring IPR regimes to bolster innovation and economic growth.

Innovation, markets and business

23. Developing an innovation-driven economy is crucial for competitiveness. A key concept linking innovation and technology with growth and development is productivity. Transformation in the capabilities of business enterprises is the key to achieving innovation and consequent productivity and performance gains, both for firms and for nations. Technological change is one of the major forces resulting in improved productivity and growth of income per capita. It implies enhanced productive capabilities, which can potentially be used to fulfill a variety of human needs and realize social goals in the context of economic development. Innovation in products, processes and organizational structures is a major source of growth and is a result of numerous interactions by a community of actors and institutions.

24. It is also well recognized that information and knowledge-based economies are characterized by targeted investment in cutting-edge R&D. Higher levels of R&D are correlated with higher levels of economic performance and thus, the importance of R&D cannot be overlooked as economies become more knowledge-based. Countries that have taken the lead are reaping the benefits of R&D potential and accelerated innovation and taking advantage of emerging global markets.

25. A broad-based innovation strategy should highlight the need for a demand-driven approach. Agricultural researchers in African countries, for instance, are facing a growing range of challenges in as much as they are required to respond effectively to the demands of policymakers, private sector investors, donor agencies, farmers and other stakeholders in the agri-food chain. Their research outputs must improve agricultural productivity, food quality and food safety and contribute to food security, poverty alleviation and sustainable development.

26. Mobile communications significantly improve quality of life, providing the tools to deliver enormous socio-economic benefits to people in developing countries. Connectivity helps to offset the lack of resources, particularly in rural areas, and provides access to a range of services, including education and healthcare, agriculture, finance, government services, small business development, etc. The annual growth rate in mobile subscription in Africa in 2007 was more than 40 per cent, with more than 80 million new subscribers. This means that network operators introducing and expanding mobile broadband services with an emphasis on developing affordable, sustainable applications and services for rural communities now have a competitive edge in this sector.

27. There is also need for an innovation-friendly market for businesses, the lack of which is the main barrier to investment in research and innovation. Such a market would stimulate and encourage innovation and, in so doing, provide firms with the incentive to raise their R&D levels and apply the full range of new technologies successfully. This requires actions on regulation, standards, public procurement, intellectual property and establishment of a culture that fosters and celebrates innovation.

28. Innovation is not only from high technology sectors. Informal collaborations within and between organizations lead to greater and more sustainable innovations than would formal research and development. Thus, businesses need to transform their structure, culture and processes to set themselves up to compete on innovation. The financing of small and medium enterprises (SMEs) and equity markets can play a critical role in fostering economic productivity by financing innovation. To increase access to equity finance for SMEs, a growing number of developing countries are creating specialized equity markets stemming from the realization that a specialized capital market segment can provide risk capital for prospective entrepreneurs and promote innovation crucial for sustainable economic growth. These markets could offer a variety of benefits, including greater access to growth capital for innovative SMEs, new jobs through entrepreneurship development, more investment opportunities for domestic portfolio investors and local venture capitalists, new sources of revenue for local stock exchanges, and an expanded mechanism for recycling public funds to promote SMEs.

29. In general, business organizations spend a significant amount of their turnover on innovation, making changes to their established products, processes and services. Systematic programmes of organizational innovation are most frequently driven by:

- a) Improved quality;
- b) Creation of new markets;
- c) Extension of the product range;
- d) Reduced labour costs;
- e) Improved production processes;
- f) Reduced materials;
- g) Reduced environmental damage;
- h) Replacement of products/services;

- i) Reduced energy consumption; and
- j) Conformance to regulations.

30. Science cooperation and investment in African science-based organizations can only benefit African economies and peoples if adequate mechanisms exist, not only to increase the regional knowledge base, but also to utilize the knowledge for economic development. As an example, geospatial technologies and related disciplines are now commonly considered as the driving force behind many applications and web services. Location-based mobile services (LBMS) are some of the high-profile services in emerging markets.

31. Whereas several African countries are improving their science, engineering and technology base, further efforts are required to enable economic benefits from publicly financed S&T. Concerted efforts are still needed to improve the commercialization of research results covering all stages of the development chain, such as:

- a) The transfer of knowledge and technology through the exchange of scientists;
- b) The agreement of research contracts and the licensing of technology;
- c) The protection of research results through Intellectual Property Rights (IPR); and
- d) Financing schemes for the commercialization of research results such as venture capital and start-up funds.

32. Areas to be covered in this sub-theme include:

- a) IPR and Patents - addressing the lack of awareness on IPR among policymakers, parliamentarians, government officials, local communities and innovators;
- b) Inadequacy of the international IPR regime to boost Africa's innovation base, the impact of IP protection on innovation and technology transfer in Africa, how patents promote creativity and innovations, and IP policies;
- c) Policy and regulatory issues on the knowledge economy - legal and regulatory frameworks; financial regulations for the electronic economy;
- d) Cyber-security issues;
- e) Infrastructure policy issues;
- f) Electronic economy and IPR;
- g) Technology transfer and indigenous technologies;
- h) Geoinformation and creative industries - geoinformation and emerging challenges and opportunities in Africa (food markets, carbon market, etc.), uses and benefits of geospatial information in socio-economic development, for enhancing economic growth, mapping social indicators, data integration and analysis framework, etc;
- i) ICT4D innovations for poverty reduction;
- j) Offshore businesses;
- k) Promotion of open source solutions;
- l) The innovation chasm - the gap between research and the application of products/services created from such research (the gap between knowledge generation and knowledge application); SMEs and ICTs - e-business, m-banking, etc;
- m) Promotion of entrepreneurship to build innovation capacities;
- n) Creation of domestic markets and development of export markets; and
- o) Integration of technology planning in the socio-economic development planning process.

IV. Objectives

33. The main objectives of CODIST-I are:

- a) To review and share best practices on the progress achieved by member States in building inclusive, people-centred knowledge societies through their national, regional and international initiatives and cooperation;
- b) To review and share best practices on the progress achieved in building national and regional STI systems, policies and mechanisms for socio-economic development of the continent;
- c) To create opportunities for benchmarking Africa's innovation performance against such key pillars of the knowledge economy as education/capacity building, ICT infrastructure/infostructures, regulatory and economic/institutional regimes, etc;
- d) To review progress achieved on the recommendations and actions of CODI-V; and
- e) To provide a roadmap (policy directions) for member States to enhance African scientific development, innovation and the knowledge economy.